cent in F_3, and 9 per cent in F_4. Back crosses with the parents resulted in about 6 per cent of cross-sterility.

Self-sterility was found to be wholly a matter of rate of growth of the pollen tubes. The pollen germinated perfectly on stigmas of the same plants, but the pollen tubes grew at the rate of about 3 mm. per day, and in no case traversed over half the distance to the ovary in the 11 days maximum life of the flowers. Growth of pollen tubes in cross-pollinated styles, on the other hand, though starting at about the same rate, was so continuously accelerated that the ovaries were reached in 4 days or less.

The simple Mendelian explanations of self-sterility proposed by CORRENS for *Cardamine pratensis* and by COMPTON for *Reseda odorata*[25] are not applicable to self-sterility in *Nicotiana*. EAST suggests that specific "Individualstoffe" of the nature of enzymes present in the pollen grains can, except in the plant that produced the pollen and in other plants of like germinal constitution, "call forth the secretion of sugar that gives the direct stimulus" to growth of the pollen tube. The hypothesis satisfies the facts presented as regards both the total self-sterility in all generations and the slight cross-sterility, which increases from generation to generation as the percentage of plants of like germinal constitution increases. It occurs to the reviewer that, if the pollen or pollen tubes have specific abilities to call forth the growth stimulus in plants of unlike germinal constitution, while the stimulus itself (the secreted sugar perhaps) is not specific, simultaneous cross and self-pollination of the same flower should result in at least partial self-fertility. Evidence derived from such pollinations would in any case be of interest.—R. A. EMERSON.

Cytology of the Mucors.—Miss KEENE[26] has given an account of the development of the zygospores of *Sporodinia grandis*. She finds at first no essential morphological difference in the two sexual branches which give rise to the zygospore. Slight differences in size are not regarded as significant. Later the branches differ somewhat in their internal structure. The protoplasm of one branch is retracted from the cell wall, the intervening space being filled with a granular substance. Sometimes there is a slight retraction of the protoplasm of the opposite branch also. The nuclei in the sexual branches are small and have the same structure as the nuclei in the rest of the mycelium. They appear to increase in number, but divisions were not observed. When the sexual branches meet, their walls coalesce in the region of contact. At this time a portion of the protoplasm in the end of each branch is delimited either by cleavage furrows which cut in from the walls, or by vacuoles which enlarge and cut through the protoplasm to the hyphal wall. In either case a central strand remains connecting the protoplasm of the suspensors with that of the gametangium. Walls cutting off the gametangium from the suspensors grow in

[25] BOT. GAZ. **57**:242–245. 1914.

[26] KEENE, Miss M. L., Cytological studies of the zygospores of *Sporodinia grandis*. Ann. Botany **28**:455–470. *pls. 2*. 1914.

from the hyphal wall. The opening is finally completely closed, and at the center an excess of material is deposited, giving rise to a papilla-like structure described as a "canal" by LÉGER. During this process the wall between the two gametangia is resorbed. The line of contact between the two protoplasmic bodies remains distinct for some time, owing to the presence between them of the granular material mentioned above, but finally the masses fuse. Multiple nuclear fusions appear to occur at this stage. The nuclei which fail to fuse are smaller than the fusion nuclei, and soon disintegrate. No evidence of a uninucleate stage was observed. At this time numerous oil bodies, which are regarded as being of the same nature as the elaioplasts of higher plants, appear in the protoplasm. These bodies fuse until two or three large ones are formed. The large elaioplast-like bodies the author believes to be the "sphère embryonaires" of LÉGER.—H. HASSELBRING.

Proceedings of the National Academy.—This new monthly publication began to appear with the January issue of 1915. In addition to the reports and announcements that belong to it naturally, as the official organ of publication of the National Academy, it will also serve as a medium for the prompt publication of brief original papers by members of the Academy and other American investigators. The papers will be much shorter and less detailed than those published in the special journals, and the aim of the *Proceedings* is to secure promptness of publication and wide circulation of the results of American research among foreign investigators. The editorial board includes a representative from each one of the special fields of science, the editor of the BOTANICAL GAZETTE being the botanical representative on the editorial board of the *Proceedings*.

The first two numbers contain the following botanical papers: *Phoradendron*, by WILLIAM TRELEASE (Proc. Nat. Acad. 1:30–35. 1915); The morphology and relationships of *Podomitrium malaccense*, by DOUGLAS H. CAMPBELL (*ibid.*, 36, 37); and A phylogenetic study of cycads, by CHARLES J. CHAMBERLAIN (*ibid.* 86–90). In addition to these papers that are credited to the section of botany, certain papers in genetics, physiology, and chemistry come well within the scope of present botanical interest. For example, the paper by E. M. EAST, entitled An interpretation of self-sterility (*ibid.* 95–100), deals with an interesting problem of genetics among plants.—J. M. C.

Evolution of the flower.—HORNE[27] has contributed a very detailed study of the structures of the flower which he regards as indicators of phylogeny. The families specially studied are the Hamamelidaceae, Caprifoliaceae, and Cornaceae, but the principles involved have general application. He includes in his discussion also the possible applications of the various theories of evolu-

[27] HORNE, A. S., A contribution to the study of the evolution of the flower, with special reference to the Hamamelidaceae, Caprifoliaceae, and Cornaceae. Trans. Linn. Soc. London II Bot. 8:239–309. *pls. 28–30. figs. 13.* 1914. .